

MASS KILLINGS AND DETECTION OF IMPACTS: Digby J. McLaren,  
Department of Geology, University of Ottawa, Ottawa, Ontario,  
Canada K1N 6N5

Highly energetic bolide impacts occur and their flux is known. For larger bodies the energy release is greater than for any other short-term global phenomenon. Such impacts produce or release a large variety of shock induced changes including major atmospheric, sedimentologic, seismic and volcanic events. These events must necessarily leave a variety of records in the stratigraphic column: (1) biological effects including mass killings resulting in major changes in population density and reduction or extinction of many taxonomic groups, followed by characteristic patterns of faunal and floral replacement; (2) stratigraphic and sedimentologic effects commonly manifest as a break in the succession - a diastem with time missing, erosion surfaces and facies changes, tsunami or storm deposits, or major slumping involving reworking of previously deposited sediments and derived fossils; (3) geochemical changes which may be associated with a global reduction event leading to precipitation of siderophiles at or near the horizon, possible hydrothermal activity, and enrichment of platinum metals including iridium - although these are rarely preserved in non-oceanic sedimentary environments.

Of these effects mass killings, marked by large-scale loss of biomass, are the most easily detected evidence in the field but must be manifest on a near-global scale. Such mass killings that appear to be approximately synchronous and involve disappearance of biomass at a bedding plane in many sedimentologically independent sections globally suggest a common cause and probable synchronicity. Diversity changes and taxa plots are of dubious value in detecting events and cannot identify an event horizon. The horizon at which a species became extinct is theoretically unknowable. Survivors after a major biomass disappearance are not uncommon. Mass killings identify an horizon which may be examined for evidence of cause. Geochemical markers may be ephemeral and absence may not be significant. There appears to be no reason why ongoing phenomena such as climate and sea-level changes are primary causes of anomalous episodic events.